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ABSTRACT

Recent research and program development in the areas of metacognition and related teaching and learning strategies is the subject of this issue of the newsletter. The lead article reviews reasons for the current interest in cognition and metacognition, clarifies the concepts of cognitive and metacognitive strategy instruction, and describes key elements of effective strategy instruction as suggested by recent research. Applications of strategy instruction in such content areas as reading comprehension, written language, social skills, and mathematics are described, and possibilities for future program development are discussed. Additional sections of the newsletter highlight two instructional materials packages, summarize current articles and research on metacognition, and describe a videocassette program which illustrates critical teaching behaviors in each of eight identified steps for learning strategy instruction. (JW)

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[Metacognition and Related Teaching and Learning Strategies]

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PRISE reporter

issues and happenings in the education of handicapped students

no. 18, March 1987

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COGNITION AND METACOGNITION: TEACHING AND LEARNING STRATEGIES FOR MILDLY HANDICAPPED STUDENTS

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Minneapolis, MN

Metacognition has been described by one researcher as, depending upon one's biases, either (a) "a key factor for understanding learning and development," or (b) "a fashionable, fuzzy cliché" (Paris, 1986, p. 341). There is considerable evidence to suggest that metacognition (and cognitive strategy instruction, as well) may be both. Certainly, these concepts have increased in popularity dramatically in recent years; in the past year alone special issues of *Exceptional Children*, the *American Psychologist*, and *Educational Psychologist* have been devoted to the role of cognition (and metacognition) in instruction. And although the terms metacognition and cognitive strategies have too often been used loosely, recent research suggests that these concepts may indeed have much explanatory power in accounting for mildly handicapped students' mastery, maintenance, and generalization of instructed skills.

This article will briefly review reasons for the upsurge of interest in cognition and metacognition, clarify the concepts of cognitive and metacognitive strategy instruction, and describe key elements of effective strategy instruction as suggested by recent research. Also considered will be applications of cognitive/metacognitive strategy training in various content areas and possibilities for future program development. In addition, relevant highlights of the upcoming PRISE Conference on Cognition and Metacognition will be included.

What is the meaning of the terms "metacognition" and "strategies"?

A variety of terms have been used to refer to the concept under consideration here: cognitive strategies, learning strategies, cognitive behavior modification, metacognition, and executive functioning. Similarly, several terms have been used to indicate the intended outcome of such instruction: the self-regulated learner, the independent learner, the self-reliant learner. The distinctions among these terms are beyond the scope of this article, but two of these concepts, metacognition and strategies, will be described further.

Metacognition has been defined as a two-part phenomenon. (a) knowledge about one's self as a learner (and one's cognitive processes), and (b) the regulation and control of learning activity. An example of metacognitive knowledge is the realization that an upcoming test will probably consist of essay questions, which require different study techniques than multiple choice questions. Planning an appropriate strategy (e.g., paraphrasing the text, outlining key points) and monitoring the effectiveness of that strategy is an example of the regulation component of metacognition.

Part of the "fuzziness" about the concept of **strategies** stems from the variety of ways in which researchers and program developers have used the term. Given disagreement among researchers as to what actually constitutes a strategy, a precise definition is difficult. But there is some consensus about key aspects of strategies.

A strategy is a plan, consisting of a set of steps, which is used flexibly and adaptively, depending upon the situation, to perform a particular task. The key concept here is strategic use of that plan in multiple situations. A technique such as underlining key phrases could easily be used in a non-strategic manner; for example, one could underline the majority of a text passage. It is only when that set of steps is modified according to the demands of the situation that it becomes a strategy.

The steps of a strategy are sometimes organized in the form of an acronym or mnemonic, to help students remember the component parts. The paraphrasing strategy, RAP, developed by the University of Kansas Institute for Research in Learning Disabilities (IRLD), described elsewhere in this issue, is an example of such a mnemonic. The steps of the strategy include self-instructions concerning the procedure, often accompanied by steps to assure monitoring of the effectiveness of those steps. But the essential feature of strategy instruction is not merely the strategy steps, but the instructional procedures used to teach the strategy. For example, the eight-step procedure developed by the Kansas IRLD included in the description of the videotape in this issue addresses assessment of prerequisite skills, guided practice, positive and corrective feedback, monitoring of effectiveness, and maintenance and generalization.

Why all the interest in metacognition and strategy instruction?

Many researchers view mildly handicapped students as deficient in the spontaneous use of cognitive strategies, yet such students can be taught to use those strategies effectively. These findings were replicated in the areas of memory, selective attention, and reading. Mildly handicapped students consistently demonstrated strategy use comparable to that of non-handicapped peers two or three years younger. Mildly

This issue of the **PRISE reporter** highlights the most recent research and program development in the areas of metacognition and related teaching and learning strategies. The featured articles and reviews will be of particular interest to those attending the PRISE Conference on Cognition and Metacognition, to be held May 7-8 at the University of Pittsburgh (see inside for details of topics and speakers).

handicapped peers were also found to be significantly less accurate about predicting the level of their performance on various tasks and monitoring their performance to determine if changes needed to be made. Increasingly, researchers have come to view such students, not as being strategy deficient, but as displaying less effective, intermediate strategies. After all, use of a strategy may be influenced by a number of conditions: task difficulty, instructions, context, and constraints of the situation.

Some researchers hypothesized that students performed less than optimally because they lacked metacognitive awareness about their capabilities and the demands of the situation. Others viewed the problem as being primarily one of lack of generalization of the taught skills to a range of situations. The result has been the development of a number of metacognitive and cognitive training programs. And although generalization has continued to be a problem, recent research shows gains in this area, suggesting that metacognition indeed appears to be a key factor for increasing our understanding of learning and development.

What has been learned from recent research on metacognition and strategy instruction?

One significant contribution of research on metacognition has been increased knowledge about children's understanding of the learning process. For example, it has been found that younger and poorer readers view reading as essentially a decoding process, while older and better readers see reading as a meaning-oriented process. Poor readers identify good readers as those students who "act right," who don't talk out or get out of their chairs; they emphasize the procedural aspects of classroom reading. In contrast, good readers make more skills-oriented responses; they see good readers as those who "get words right away" or can read quickly. Young or poor readers may not have the same understanding of such concepts as a paragraph or main idea as we as teachers assume they do.

Increased metacognition has been associated with increased and more effective use of cognitive strategies; students with greater levels of metacognitive awareness have also been found to profit more from metacognitive training. Similarly, older students (intermediate through secondary grades) have been found to be more responsive to strategy training than younger students.

Recent research suggests that teachers who are the most effective in fostering increased metacognitive awareness in their students are those who are the most explicit in explaining the processes they are teaching, such as the reading comprehension processes. More effective teachers emphasize the applicability of the strategy they are teaching and how to recognize when to use the strategy, as well as the mental process to use. Responsibility for implementing the strategy should shift gradually from the teacher to the students. The teacher begins by modeling the strategy, provides directives to the students on how to use the strategy, questions the students about use of the strategy, and finally fosters independent student use of the strategy.

Numerous studies indicate that students given feedback about the effectiveness of strategies use those strategies more often than students who are not provided such feedback. Research also suggests that instruction in how to monitor the effectiveness of a strategy may be critical. Students taught to monitor strategy utility by keeping track of the effectiveness of different strategies in completing a task used the strategy over a longer time period than students not provided such instruction. Students should be provided practice in (a) monitoring their performance, (b) inferring causal relationships between strategy use and improved performance, and (c) selecting a strategy based on knowledge of the effectiveness of different strategies.

How has strategy instruction been applied to the content areas?

Much of the early work in strategy instruction with special populations was in the area of memory. Students were taught a variety of strategies, such as rehearsal of words in a list, but such efforts typically used laboratory-type tasks rather than actual classroom applications of memory skills. More recently, there has been promising research with mildly handicapped students on elaboration and memory strategies, such as the keyword method and imagery techniques. Work in this area will be reviewed at the PRISE Conference.

Many of the research and development efforts in strategy instruction have focused on **reading**, particularly reading comprehension rather than decoding, and increasingly such programs are becoming commercially available. For example, the *Reading and Thinking Strategies* program and the *Teaching Reading as Thinking* program, both described elsewhere in this issue, will be presented at the PRISE Conference. Several of the strategies developed and validated by the University of Kansas IRLD, such as the paraphrasing strategy noted elsewhere in this issue, address reading comprehension skills.

Recently, there has also been considerable development work in the area of **written language**. The last issue of the **PRISE reporter** described the stages of an effective writing program; that approach will be described in more detail at the PRISE Conference. Additional sessions will review a self-instructional writing skills program and approaches to teaching students to summarize text.

The **social** domain has been the focus of relatively fewer efforts in cognitive and metacognitive strategy instruction. One such effort, the *Metacognitive Approach to Social Skills Training*, described elsewhere in this issue, will be presented at the PRISE Conference, along with a peer teaching procedure using classwide Student Tutoring Teams to improve academic performance.

Mathematics is also beginning to be the focus of strategy instruction development, particularly in the area of solving word problems. Since such approaches are in the relatively early stages of research and program development, they are not yet commercially available. Several sessions at the PRISE Conference will feature approaches to learning basic math facts and solving word problems.

Recently researchers have underscored the importance of a **motivation** component in strategy instruction programs that address any of the above content areas. Strategy training efforts that teach students to recognize the role of effort in improving their performance have resulted in longer term maintenance and broader generalization of instructed strategies. Included in the PRISE Conference will be sessions on techniques and procedures that can be used to increase students' commitment to learn and assist them in gaining greater control over their own learning progress.

What lies ahead?

Strategy instruction has led to striking improvements in mildly handicapped students' performance, sometimes raising it to the level of performance of their nonhandicapped peers. Also greater success is being achieved in facilitating the generalization of such strategies. However, it should be noted that strategy instruction is no panacea. It can require significant role changes by teachers, extended periods of instruction, and attention to the prerequisite skills required for the strategies being taught.

The challenge, then, is to continue in the quest for clarification in applying the concepts of metacognition and effective strategy instruction in program development efforts. This will help in assuring that mildly handicapped students attain

mastery, maintenance, and generalization of instructed strategies. The research and program development efforts described in this issue and those presented at the PRISE Conference on Cognition and Metacognition can go a long way toward assuring that metacognition and strategy instruction are much more than a "fashionable, fuzzy cliché." These concepts provide key factors for understanding learning and development. The challenge now lies not just with researchers and program developers, but also with those who adopt and implement these approaches in their classrooms.

Reference

Paris, S.G. (1986) **Review of Metacognition, Cognition, and Human Performance: Vol. 2, Instructional Practices.** *Journal of Reading Behavior,* 18(4), pp. 341-343.

Linda J. Stevens is a doctoral candidate in the Department of Educational Psychology at the University of Minnesota, and is Publications Consultant for PRISE. She is responsible for selecting the themes and resources featured in the **PRISE reporter** and selected the speakers and organized the program for the PRISE Conference on Cognition and Metacognition. Stevens co-developed a training manual for a metacognitive program to teach study strategies, and is conducting training for the Council for Exceptional Children on learning strategies as part of their Academy on Effective Instruction.

INSTRUCTIONAL MATERIALS

The **Metacognitive Approach to Social Skills Training (MAST)** is designed to teach students how to self-direct, self-monitor, self-evaluate, and self-correct in order to produce social behaviors that lead to successful living in a highly complex world. The lessons can be used by fourth through twelfth grade teachers of regular, gifted, alternative education, and handicapped students as well as counselors and psychologists who provide social skills training.

The MAST program is based upon the premise that internal control is necessary to responsible, productive behavior, and problem solving. A variety of activities are used to teach students the metacognitive skills to evaluate the demands of a new situation, formulate a plan for self-directed behavior, monitor the success of their behavior in achieving their goals, and correct their plan as needed for a successful outcome. These metacognitive social skills empower the student to become self-controlled, ultimately no longer requiring the direction of teachers, counselors, and parents to behave appropriately and solve problems.

The program consists of forty units, each containing from two to eight lessons on the unit topic. Lessons are built around the following areas: Who am I? Where am I going? How will I become the person I choose to be? How do I get what I want from others? Who is in charge of my life? Formats include brainstorming, large and small group interaction, role playing, videotaping, scripting and interviewing. The role of the leader includes the use of metacognitive questioning and outloud thinking. To facilitate mastery of these techniques, scripts are provided for the first three units.

Sheinker, Jan and Sheinker, Alan. **Metacognitive Approach to Social Skills Training.** 1986. $65.00. 250 p. White Mountain Publishing Co., P.O. Box 1072, Rock Springs, WY 82901.

The objective of the two **Reading and Thinking Strategies (RTS)** kits is to teach students how, when and why to use various comprehension strategies to help them become self-directed, independent readers. One kit is intended for use in grades 3 and 4, the other for grades 5 and 6. Each kit is divided into nine instructional modules. Each module concentrates on one specific reading strategy which is taught through the use of a metaphor depicted on a large poster. Examples of two of the modules used for grade 3 are: "Understanding Goals and Purposes of Reading (Searching for Reading Treasure)" and "Using Content and Prior Knowledge (Building Bridges to Meaning)." Among the strategies for grade 5 are "Identifying Comprehension Strategies (Tools for Understanding)" and "Plans to Construct Meaning (Blueprints for Meaning)." Also included with each kit are 27 lesson cards, 1 teacher guide, and 5 student workbooks. Additional workbooks may be purchased separately.

Scott G. Paris. D. C. Heath and Company, Collamore Educational Publishing, 125 Spring St., Lexington, MA 02173. 1987. Set of 2 kits (Grades 3-4 and Grades 5-6). $139.95 each.

(Jan Sheinker and Scott Paris will be speakers at the PRISE Conference on Cognition and Metacognition in May).

CURRENT CITATIONS

Levin, J. R., & Pressley, M. (Eds.) Special issue: **Learning Strategies.** *Educational Psychologist,* 1986, 21(1,2), pp. 1-16. This collection of eight essays focuses on the topic of learning strategies and investigates how students benefit from training in how to learn. Theoretical, empirical, and practical approaches to the central issues of learning strategy instruction are addressed. These include strategies for problem solving, computer-based Logo instruction, and mathematics instruction. Also addressed are specific cognitive and metacognitive issues related to learning strategy instruction as well as analyses of the teaching and learning strategies that are used by teachers and students in actual classroom contexts.

In "The Relevance of the Good Strategy User Model to the Teaching of Mathematics," Michael Pressley reviews the strategic metacognitive and knowledge components of good strategy use. Good strategy use requires knowledge of many strategies, practice of the strategies, and acquisition of extensive metacognitive knowledge. Five principles of teaching from the good strategy user model are illustrated by highlighting the teaching of arithmetic. Practitioners are advised to: (1) teach strategies; (2) teach knowledge about when, where, and how to use strategies, (3) teach general knowledge about factors that promote strategy functioning; (4) teach relevant non-strategic knowledge, and (5) require students to practice components of good strategy use and the coordination of components.

Wong, B. Y. L. **Metacognition and Special Education: A Review of a View.** *Journal of Special Education,* 1986, 20(1), pp. 9-29. This paper considers both the contributions and limitations of metacognition to special education and includes relevant research findings from learning disabilities and mental retardation to support these contentions.

Metacognition has made important contributions to three specific areas: (1) By emphasizing the critical role of phonemic awareness in the child's process of learning to read, metacognition provides understanding of the failures of some children to learn to read. (2) As evidenced by their poor scholastic achievement, LD students lack the metacognitive skills which underlie efficient reading and effective studying. (3) Metacognition is one contributor to the failure of LD students to maintain and generalize learned strategies.

The author examines metacognitive research concerning awareness of one's purpose in reading, sensitivity to important parts of the text, comprehension monitoring as indicated in detecting inconsistencies, and the use of debugging strategies. Metacognition also provides insights into mentally retarded

students' failure to maintain and generalize learned strategies. These insights have led to improved training procedures that increase the ability of the trainees to maintain and transfer strategies. Students are made aware of the purpose and significance of training, the relationship between the learned strategy and improved performance, and the range of strategic applicability.

(Michael Pressley and Bernice Wong will be speakers at the PRISE Conference on Cognition and Metacognition in May).

PRISE CONFERENCE

A Conference on **Cognition and Metacognition: Teaching and Learning Strategies for Mildly Handicapped Students** is being sponsored by PRISE in cooperation with the University of Pittsburgh, Institute for Practice and Research in Education, on May 7-8 at Benedum Hall, University of Pittsburgh. The keynote speaker is Dr. Donald D. Deshler, University of Kansas, whose presentation is titled, "Cognitive Strategy Training: Another Fad or Something of Substance?". Topics to be covered at the conference include reading comprehension, mathematics, written language, study skills, social skills, and generalization. The conference is designed for special education teachers, school psychologists, administrators, curriculum coordinators, and parents. A partial listing of speakers and session titles includes:

Richard L. Allington, SUNY at Albany, *Curricular Coordination, Cognition and the Acquisition of Literacy in Mildly Handicapped Learners*

John Beattie, Univ. of North Carolina at Charlotte, *Arithmetic and Cognition with Mildly Handicapped Students*

Gerald G. Duffy, Michigan State Univ., *Teaching Reading Skills as Metacognitive Strategies*

Carol Sue Englert, Michigan State Univ., *Expository Writing Strategies for the Mildly Handicapped*

Steve Graham, Univ. of Maryland, *Improving Writing Skills: Self-Instructional Strategy Training*

Margaret G. McKeown, Univ. of Pittsburgh, *Research-based Instructional Strategies for Vocabulary Development*

Larry Maheady, Michigan State Univ., *Peer-mediated Instructional Approaches: Expanding Students' Opportunity to Learn*

Michael Pressley, Univ. of Western Ontario, *How to Overcome Obstacles to Strategy Instruction* and *Elaborative Learning Strategies for Handicapped Learners*

Jan Sheinker, White Mountain Publishing Co., *Metacognitive Approach to Social Skills Training*

Tony Van Reusen, Univ. of Arizona, *Training Learning Disabled Adolescents to Use an Education Planning Strategy in the IEP Process* and *Training Learning Disabled Adolescents to Use a Goal Regulation Strategy*

Bernice Y. L. Wong, Simon Fraser Univ., *Teaching Summarization Skills* and *Suggestions for Teaching Junior High Students How to Write Essays*

PANELS

Moderator: **Linda J. Stevens**, Univ. of Minnesota, *Where Theory Meets Practice: Issues in Implementing Strategy Instruction*

Moderator: **Jean Brownlee-Conyers**, Glenview, IL Public Schools, *Tales from the Trenches: Learning Strategies in Practices*

Moderator: **Linda J. Stevens**, Univ. of Minnesota, *Beyond the Resource Room: Achieving Strategy Transfer*

Moderator: **Tony Van Reusen**, Univ. of Arizona, *Changing Roles and Expectations: Staff Development for Strategy Instruction*

MINI-WORKSHOPS

Presenter: **Donald D. Deshler**, Univ. of Kansas, *Learning Strategy Instruction in the Classroom*

Presenter: **Edwin S. Ellis**, Univ. of South Carolina, and **Linda J. Stevens**, Univ. of Minnesota, *Effective Instruction for the Acquisition and Generalization of Learning Strategies*

Presenter: **Scott G. Paris**, Univ. of Michigan, *Metacognitive Instruction for Reading and Thinking Strategies*

Presenter: **Jan Sheinker**, White Mountain Publishing Co., *Study Strategies: A Metacognitive Approach*

In addition to the above sessions there will be informal Round Table discussions focusing on a variety of related topics.

VIDEO

Learning Strategies Instruction, a system developed by Donald Deshler and Jean Schumaker, is introduced and illustrated in this videocassette program entitled **Keys to Success in Learning Strategy Instruction.** The program introduces intervention procedures which will allow students to become independent learners. In addition, it provides teachers with effective instructional principles to improve their students' success. The videocassette program illustrates critical teaching behaviors in each of eight identified steps for learning strategy instruction. The process begins with a pretest to determine whether a student needs to be taught a particular strategy.

In step two the strategy is described by the teacher. In the example used in the videocassette, the resource room teacher introduces paraphrasing. The steps of the strategy are: 1) **R**ead the paragraph. 2) **A**sk yourself the main idea of the paragraph and at least two details. 3) **P**ut the main idea and details into your own words. (In listing the steps of the strategy, the teacher has created a mnemonic device to help the students remember them.) Next, the teacher models the strategy, demonstrating the cognitive processes that are involved in using the strategy. At this point, verbal rehearsal of the steps of the strategy is necessary so that the process becomes automatic.

Steps 5 and 6 include student practice of the strategy with controlled and grade appropriate materials. After the practice situation, it is necessary to provide feedback, beginning with specific positive feedback that focuses on the gains that have been made, followed by specific corrective feedback in areas of difficulty. In step 7, responsibility shifts to the students. Attention is focused on why the strategy was learned, and students establish specific goals for applying the strategy throughout their curriculum. Step 8 begins with an orientation phase when the teacher makes students aware of how broadly the strategy can be applied. Students are tested at an unexpected time to see if they have mastered the technique. Finally,

cooperative planning with all teachers involved in a particular student's curriculum is demonstrated.

1/2" VHS Videocassette/90 minutes/color/$95.00/1984

Excel Enterprises, Inc., P.O. Box 972, Lawrence, KS 66044.

The University of Kansas Institute for Research in Learning Disabilities, which developed the Strategies Intervention Model described in this videocassette, makes the Learning Strategies Curriculum available to educational agencies who commit to a staff development program designed to make their staff proficient in the use of these materials. Information concerning training can be obtained from Dr. Frances L. Clark, Coordinator of Training, University of Kansas IRLD, 223 Carruth-O'Leary Hall, Lawrence, KS 66045 (913/864-4780).

Teaching children how to comprehend is the main focus of this 30 minute video program, **Teaching Reading as Thinking.** The video presents reading as a thinking process and notes that the reader must be actively involved in determining what the meaning of the text represents. Researchers believe that for active construction of meaning to take place, the reader's own perspective, prior knowledge, and experience are critical factors. In addition, the reader is influenced by his or her purpose for reading, which might be skimming for main ideas, memorizing facts, or reading for pleasure. Self-monitoring and self-regulating skills must also be taught; students need to "question themselves as they read, to become conscious of what they know and don't know, and to actively bridge gaps in their own life."

The program discusses three areas in which teachers can influence students' comprehension of what they read: before reading, during reading, and after reading. In the before reading process, students should "preview the general content and structure of the selection, identify related prior knowledge, and have a reason or purpose that focuses their interest." Features of this phase include discussion and brainstorming, a review of what is known about the topic, vocabulary lists, and predictions. The during reading process is the most difficult because it requires that the teacher keep students actively involved in reading by helping them to assess themselves and to think critically about what they are reading. Strategies such as underlining information in the text or writing it down on worksheets or in notebooks may be helpful.

In the after reading stage, students look at the meaning of the entire passage they have read, assess whether their reading purposes were met, consolidate what they have learned, and apply the knowledge. Comprehension questions or concrete group activities which require students to return to the text and reread and recheck information can be used during this phase.

3/4" V-Matic Videocassette/Teacher's Guide/
30 minutes/1986/$225.00

Association for Supervision and Curriculum Development, 225 N. Washington St., Alexandria, VA 22314.

(Among the individuals featured in this videotape is Donna Ogle of the National College of Education, who will be a speaker at the PRISE Conference on Cognition and Metacognition in May).

Solutions Unlimited is an eight unit software and video package that teaches both a general problem solving approach and specific problem solving techniques. Each of the eight units can be used independently by individuals, groups, or the entire class; the same teaching sequences are applicable to each unit. Printed materials provide teaching suggestions and worksheets for student activities.

Unit one introduces a general, four step systematic problem solving process that is woven into each of the subsequent topics. The steps are easily identified as: "Hey Wait!", "Think", "See", and "So?". While the process is relatively simple to use, it is emphasized that problems generally have more than one acceptable solution and after a solution is evaluated alternative choices should be examined. After viewing an 8-minute video dramatization of the process, students use computer software to review the steps of problem solving and participate in an interactive simulation that requires generating solutions to a personal problem. By selecting different responses to the same questions, students can examine how alternative approaches may impact on the results of problem solving. Subsequent units involve the development and practice of more specific problem solving techniques: time management, considering alternatives, information gathering through note-taking and analysis of pictorial information, questioning and generating alternatives. The final computer program simulates a plane crash in the wilderness and requires students to use all the skills developed in previous units in order to survive.

Agency for Instructional Television, Box A, Bloomington, IN 47402. 1984. Available through Instructional Media Centers in each Intermediate Unit (call 800/457-4509 for further information). Hardware Requirements: TRS-80 Models III or IV or Apple II+/e/c, Color Monitor Optional.

ASSESSMENT

Lloyd, J. W. and Loper, A. B. **Measurement and Evaluation of Task-Related Learning Behaviors: Attention to Task and Metacognition.** *School Psychology Review,* 1986, 15(3), pp. 336-345.

Responding to the absence of commercial instruments for assessing variables frequently associated with academic performance, Lloyd and Loper describe in this article methods for developing assessment procedures for two such variables: attention to task and metacognition. Their three-step method of assessing attention to task, or on-task behavior, includes suggestions for 1) classroom observation, using momentary time sampling; 2) establishing criteria for intervention (typically attention to task less than 60% of the time); and 3) monitoring progress.

Metacognition is defined by the authors as understanding of one's own cognitive processes and of the information needed to perform a specific task, understanding which enables one to employ an existing strategy or to devise a new one to make use of this information.

Suggested metacognitive assessment procedures consist of 1) initial assessment – observation and informal interview using the Informed Strategies for Learning (ISL) questionnaire; 2) assessment treatment – conducting training several times per week using programs which typically train students in self-questioning techniques, and 3) trouble-shooting, guided by attention to several questions. Among those questions suggested are the following: Are instructions sufficiently explicit? Are sufficient task demands placed on the student? Does the intervention match the skill level of the student? Is the procedure interfering with other important processes? Is the student sufficiently informed of progress?

The authors conclude by discussing several common characteristics of assessment: 1) the need to measure the behavior of concern rather than indirect behavior; 2) the need to take measurements repeatedly; and 3) the need for data-reactive intervention, i.e., intervention developed on the basis of concrete evidence.

RESEARCH

Thinking Aloud Used as Reading Comprehension Strategy

The identification of successful strategies for dealing with reading comprehension difficulties is significant for educators. Most reading improvement strategies make use of procedures carried out either *before* or *after* the initial reading of a passage. However, skilled readers are often distinguished by strategic behavior carried out *during* the course of initial reading (i.e., on-line). The research described in this article deals with identifying and teaching such on-line strategies.

The study involved two parts. First, 10 adult subjects were taught to think aloud (verbalize) while reading, and from this activity four main strategies evolved for dealing with comprehension difficulties. These were: restatement (rephrasing or paraphrasing of text), backtracking (rereading), recognizing relationships (setting up "watchers" for cause and effect or reason), and problem formulation (defining a problem and disposing of it). Part two of the research investigated the teachability of the strategies identified in Part one and the usefulness of thinking aloud as an instructional vehicle. Subjects were 40 male and 40 female 7th and 8th-grade students with average or above average reading scores. The following instructional techniques were used along with a control condition: 1) modeling-plus-explanation, 2) modeling only, and 3) exercise (oral and written).

Results indicated that three of the four target strategies were teachable: restatement, backtracking and problem solving. The findings suggest that modeling and direct instruction can be combined effectively in the teaching of cognitive strategies. Thinking aloud appears to have value both for demonstrating strategies and recognizing and using the strategies.

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Bereiter, C. & Bird, M. **Use of Thinking Aloud in Identification and Teaching of Reading Comprehension Strategies.** *Cognition and Instruction,* 1985, 2(2), pp. 131-156.

Center for the Study of Learning (University of Pittsburgh)

The Center for the Study of Learning (CSL), which is in its second year, is housed within the Learning Research and Development Center which was established at the University of Pittsburgh in 1964. The CSL is devoted to applying the most advanced scientific resources to the study of school subject-matter learning. Its goal is to provide knowledge that will help raise levels of educational performance for all children, from the most difficult to teach to the most talented. To accomplish this, CSL focuses its research efforts on examining the appropriate relationship between the acquisition of general capabilities in learning, reasoning, and problem solving, and the acquisition of specific competence in school subject-matter in mathematics, science, and social studies. The Center serves as a national resource for bringing research in learning to bear on the problems of improving instruction in schools, fostering collaboration and exchange among researchers studying learning, and increasing communication between researchers and practitioners in education.

DISSEMINATION HAPPENINGS

The Council for Exceptional Children is offering training in **Learning Strategies for Secondary Students** as part of its "Academy on Effective Instruction: Working with Mildly Handicapped Students." Designed for secondary teachers who want their students to generalize learning strategies for improved performance in mainstreamed classrooms, the training will provide opportunities for participants to identify and practice effective instructional techniques for teaching learning strategies to secondary students. Videotapes of students using metacognitive and cognitive strategies to acquire, organize, and remember information will be viewed. Training will be offered Monday, April 20, 1987 as part of CEC pre conference activities in Chicago, and in late July in Boston. Individual arrangements can be made for CEC to help school districts design and deliver inservice programs for teachers and supervisors on effective instruction for mildly handicapped students.

Contact Ellen Peters, Department of Professional Development, Council for Exceptional Children, 1920 Association Drive, Reston, VA 22091, 703/620-3660.

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